

An alchemical cipher in a shared notebook of John and Arthur Dee (Sloane MS 1902) [Work In Progress]

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Abstract

Alchemy, while being known for its secrecy, cryptographical and stylistic devices, isn't known for its ciphers in particular. However, ciphers can sometimes be found in alchemists' and chymists' (laboratory) notebooks. This paper discusses a ciphertext and cipher table found in a shared notebook by John and Arthur Dee (Sloane MS 1902). It presents a bibliographical description as well as context for interpretation. However, thus far it has not been possible to solve the cipher.

1 Introduction: Ciphers in the context of alchemical secrecy

The secret is paradigmatic of alchemy (Principe, 2013). It is a topos in secondary literature about alchemy as well as the alchemical tradition itself. Over the last decades, secrecy studies have contributed important new insights on early modern secrecy, its contents (such as recipes), its media (such as books of secrets) and its plethora of related practices, especially with regard to scientific secrecy (Vermeir, 2012). While the discussions around the 'New Historiography of Alchemy' led by W. Newman and L. Principe have greatly improved the methodology for the discussion of alchemical language and its secrets, studies on secrecy more specific to alchemy are yet lacking (Principe and Newman, 2001). Much has been written about the cultural and practical significance of secrecy in alchemy (Principe, 2013), its proclivity for playful encipherment (Bilak, 2020) but also its rhetoric of secrecy in the 'economy of secrets' (Jütte, 2011) which serves as the marketplace for 'entrepreneurial alchemy' (Nummedal, 2007) and the circulation of crafts knowledge.

Alchemy and chymistry, for the most part, are known for their cryptographic devices which

are metaphorical and qualitative in nature, such as anagrams or *Decknamen* (Newman, 1996).¹ Stylistic devices, so to say, rather than actual ciphers based on mathematical principles and letter substitutions. The result is a somewhat special status of alchemical secretive devices which are mostly non-mathematical but rather qualitative in nature, compared to the rest of the cryptological landscape of their contemporaries. Agnieszka Rec laments that alchemical ciphers remain a seriously understudied topic, especially given the abundance, even omnipresence of such devices in alchemical literature (Rec, 2014). Consequently, alchemy thus far lacks contextualization in strictly cryptological contexts: David Kahns *The Codebreakers*, the classic work of cryptography studies, only mentions alchemy in passing (Kahn, 1996).

However, chymical laboratory notebooks have been known to contain ciphers (Newman and Principe, 2003). It is along those lines that we can locate the topic of the present paper: We discuss an alchemical cipher found in a shared notebook of John and Arthur Dee, Sloane MS 1902 (reproduced in figures 1–3).

2 An alchemical cipher by Arthur Dee? Sloane MS 1902

Sloane MS 1902 is a small Paracelsian astrological medical notebook containing notes from father and son, John Dee (1527–1608) and Arthur Dee (1579–1651). While his father John has been a popular subject of historical studies, studies on Arthur Dee remain scarce (Piorko, 2019). Arthur's handwriting is similar to his father's but can be differentiated with a careful eye.² The pages that contain John's notes are exclusively parchment

¹The historiography of the term 'chymistry' has been studied in detail (Principe and Newman, 2001).

²We conclude by a handwriting analysis comparing the relevant pages to Arthur Dee's manuscripts and his father's handwriting in the same medical notebook that the cipher and table are in Arthur's handwriting. Also, a material analysis of

- Fols. 13r/13v-14r: Ciphertexts and cipher table.
- Fols. 11v-12v, 28v, 30r/v, 31r/v: References to alchemical authors and processes.

The leaves of this tiny square commonplace book are taped together, rather than sewn, to create a codex. After the loose leaves were assembled into codex form, an owner wrote page numbers on the top right on the recto of each leaf. It is bound in a Sloane collection binding with a gold gilt Sloane library stamp on the front and “BRIT. MUS.—S.L. 1902/ASTROLOGICAL NOTES” on the spine. Five types of alchemical-medical knowledge making categories can be gleaned from this manuscript. Sometimes the leaves of this notebook are written on both recto and verso sides on related topics, when that is the case they will be referred to as unit (example: 4r/v). As this manuscript is a collection of John’s loose notes filled in later by Arthur, it is more fruitful to examine its pages as two sides of a single leaf which may have corresponding information on the recto and verso rather than as a codex with continuous information from left to right, which modern readers are inclined to do. Evidence such as the later additions to John’s notes on parchment, the matching size of the paper that Arthur used, and the corresponding relationship between the folios indicate that Arthur created the codex and added to it in response to his father’s notes.

2.3 The ciphertext and code table (folios 13r/13v-14r)

Folio 13 is bound upside-down in the notebook. Both the recto and verso are filled with prose written in a ciphertext, with the Latin title *Hermeticae Philosophiae medulla* (‘Marrow of the Hermetic Philosophy’). Folio 14 recto is also upside-down in the context of the majority of the codex and contains a grid cipher for the ciphertext on folio 13. The pages that are written upside down correspond to Arthur Dee’s handwriting, and are written on the reverse side of a correctly oriented leaf written in the hand of his father. The code is not a simple monoalphabetic substitution cipher (for example, ‘n’ represents ‘a’). Digital cryptanalysis algorithms commonly available on the web yielded no meaningful results.

3 Conjectures on the context of the cipher

All of the pages with ciphers are pasted upside down into the booklet. Referring to this notebook specifically, there is just one publication (Appleby, 1977). However, it doesn’t analyze it or give further information. The approximate dating is 1610, assuming the upside-down cipher parts were written by Arthur. Somewhat similar tables are also to be found in the Book of Soyga (*Aldaraia sive Soyga vocor*), a 16th century Latin treatise owned by John Dee. Among other content on magic stemming from the context of the Christian Cabalistic tradition, there are several so-called Magic Tables (Reeds, 2006). However, it seems unlikely that there is a relationship. Furthermore, René Zandbergen and Rafał T. Prinke demonstrate that the evidence that John Dee ever owned the Voynich MS (and that Arthur Dee saw it as a child) is very thin and hardly reliable (Zandbergen and Prinke, 2016), so a connection to the Voynich isn’t likely either.

The ‘medulla’ (*marrow*) mentioned in the plaintext heading could possibly be a reference to the text “Benjamin Lock his Picklock to Riply his Castle” which Arthur Dee copied as a manuscript. Furthermore, Lock was a student of John Dee’s.⁴ *Medulla* could also be a reference to Ripley’s *Medulla* (*Georgii Ripley Angli Medvlla Philosophiae Chemicæ*, 1614) which “is a Latin re-translation of the English *Marrow*” (Rampling, 2012).

Given that the main languages used by both John and Arthur Dee are English and Latin but the plaintext heading is in Latin, we assume that the language of the ciphertext must be either Latin or English.⁵ It is not a simple Caesar cipher or other monoalphabetic substitution cipher, since a frequency analysis shows no spikes for vowels and an overall too uniform distribution for a simple substitution cipher. Substitutions based on the table reproduced as Figure 3 didn’t even yield partial results. Either the correct usage of this table eludes the authors of this paper (which is very possible) or the table might have been a try by the Dees themselves to crack the cipher. The key table visually resembles a *tabula recta*, so it’s likely

⁴This can be gathered from the Wellcome MS 436.

⁵The notebook has Latin and English texts to equal parts with John writing mostly in Latin and Arthur writing mostly in English with some cross-over.

a Vigenère-type cipher, however, the solution has thus far eluded the present authors. A set of likely keywords was tried out but none yielded any results.

The cipher table from Figure 3 matches those of the Bellaso/Della Porta ciphers which are polyalphabetic substitution ciphers similar to the Vigenère (Buonafalce, 2006). However, while Vigenère ciphers use 26 alphabets, Bellaso/Della Porta ciphers only use 13 reversible alphabets, each being associated with two letters from the alphabet (like the row indices ‘AB’, ‘CD’, etc. in Figure 3).⁶

While John Dee was a mathematician well versed in ciphering techniques, his son Arthur was not. Albeit it is likely he was exposed to the subject area through his father. Since neither the exact context nor author of this cipher table and ciphertext are known, it is possible that, for example, the ciphertext was copied into this notebook by either John or Arthur Dee from an external source. The table could have been used to encode the ciphertext but it could just the same have been a (possibly unsuccessful) attempt at solving the ciphertext from figures 1 and 2.

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- ⁶According to the DCODE online tool, the Friedman index of coincidence is: 0.04506 which would indicate a probable key of length of 2,3, 4, 6, 7, 13, 19 or 24 (<https://www.dcode.fr/index-coincidence>). Since the ciphertext isn’t very long, this test cannot be expected to be particularly successful. However, it is to be expected from the cryptographic habits of that time period that the key can indeed be found within the same notebook or even the document itself. A quick survey of likely candidate words (‘monas’, ‘medulla’, ‘adam’, ‘ripley’, ‘riply’ and so forth) did not yield any results.
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